
A New Species of *Guadua*, *G. calderoniana* (Poaceae: Bambuseae), with Notes on the Genus in Bahia, Brazil

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Guadua Kunth (Poaceae: Bambusoideae: Bambuseae) is a genus of ca. 25–30 species occurring in forests and savannas from Mexico and northern South America to Paraguay and Argentina, with a center of diversity in western Amazonia and the Orinoco basin (McClure, 1973; Young, 1985; Soderstrom & Londoño, 1987, 1988). Until now, no named species have been reported from Bahia, Brazil (Renvoize, 1984). However, study of collections made by C. E. Calderón and T. R. Soderstrom have enabled us to identify three species of *Guadua* from the state: *G. paniculata* Munro, *G. tagoara* (Nees) Kunth, and a new taxon herein described and illustrated. We provide a key to all Bahian representatives of the genus, along with descriptions (terminology follows that of Soderstrom & Londoño, 1988) and lists of specimens examined.

Key to the species of *Guadua* from Bahia, Brazil
(based only on Bahian material)

- 1a. Culms robust, 6–10(–15) cm diam.; culm leaf blades broadly triangular, at most as long as the sheaths; foliage leaf blades 21–30 × 3–7 cm 3. *G. tagoara*
- 1b. Culms more slender, 2–6 cm diam.; culm leaf blades narrowly triangular, usually longer than the sheath; foliage leaf blades 14–27 × 0.7–3.7 cm.
 - 2a. Foliage leaf blades 15–27 × 2–3.7 cm, ovate- to oblong-lanceolate; sheaths with prominent auricles 5–10 mm long, bearing prominent setae 15–25 mm long; wings of the palea keels glabrous, smooth, ca. 1 mm wide; culm leaf blades persistent 1. *G. calderoniana*
 - 2b. Foliage leaf blades 14–18 × 0.7–1 cm, linear-lanceolate; sheaths rarely auriculate (auricles if present less than 5 mm long), bearing setae only 8–10 mm long; wings of the palea keels silky-pubescent, ciliolate, less than 0.4 mm wide; culm leaf blades caducous 2. *G. paniculata*

near Rio Maroim, in flower, 22 Feb. 1979, C. E. Calderón & T. S. dos Santos 2476 (holotype, CEPEC; isotypes, B, CANB, COL, CTES, F, G, ISC, K, LE, MO, NY, P, PE, PRE, SGO, SI, SP, TULV, US—3 sheets, USCH, W, WIS). Figures 1, 2.

Bambusa lignosa spinosa 10–20 m × 2–3.5 cm; internodia firma, fere solida. *Folia culmorum* coriacea; lamina persistens, erecta, plerumque lanceolato-triangularata, 20–35 cm longa. *Ramificatio* intravaginalis. *Folia* in complemento 12–15; vagina pubescens biauriculata, auriculis falcato-lanceolatis prominentibus longisetosis; setae copiosae, patulae, 15–25 mm longae; lamina ovata-lanceolata vel oblongo-lanceolata, 15–27 × 2–3.7 cm. *Synflorescentiae* indeterminatae, terminales. *Pseudospiculae* lanceolatae, robustae, erectae, bracteis subtendentibus singulis, prophylo singuli, bracteis gemmiferis 2–4, bracteis vacuis plerumque 1 raro 2, lemma fertilia singula cum rudimento paleae; flosculis 4–10; lemma ovato-lanceolatum, 17–27 mm longum, 23–27-nervatum, dorsaliter breviter hirsutulatum; palea glabra carinis alatis 2, alis 1 mm latis. *Lodiculae* 3. *Stamina* 6, filamentis liberis. *Ovarium* fusiforme, sursum breviter pubescens; stylus singulus; stigmata tria plumosa. *Fructus* cariopsis.

Densely unicespitose woody, thorny bamboo. *Rhizomes* sympodial, pachymorph. *Culms* green, erect when young, bending or arching after developing foliage leaves, 10–20 m tall, 2–3.5 cm diam., sometimes leaning on or pendent from trees; *internodes* 30–35 cm long, terete, smooth or slightly roughened, solid or nearly so with very thick walls and a small central lumen; *nodes* solitary, the sides parallel in longitudinal section, the single nodal line horizontal, an upper nodal ridge also manifest, a dense but inconspicuous band of ca. 1 mm long, appressed, tawny hairs extending about 5 mm below and 10 mm above the nodal line; *bud* solitary, covered by a prophyllum, positioned between the nodal line and the upper nodal ridge, not elevated on a promontory. *Culm leaves* coriaceous, light beige in color when young, later stramineous and deciduous, 30–60 × 7–13 cm (basal width); *sheath* densely strigose abaxially, covered with short, hard, brown or hyaline persistent hairs, shiny and glabrous adaxially, 20–28.5 × 8–11 cm, the summit slightly

1. *Guadua calderoniana* Londoño & Judziewicz,
sp. nov. TYPE: Brazil. Bahia: Mun. Ilhéus, ca.
30 km SW of Olivença on road to Vila Brasil,

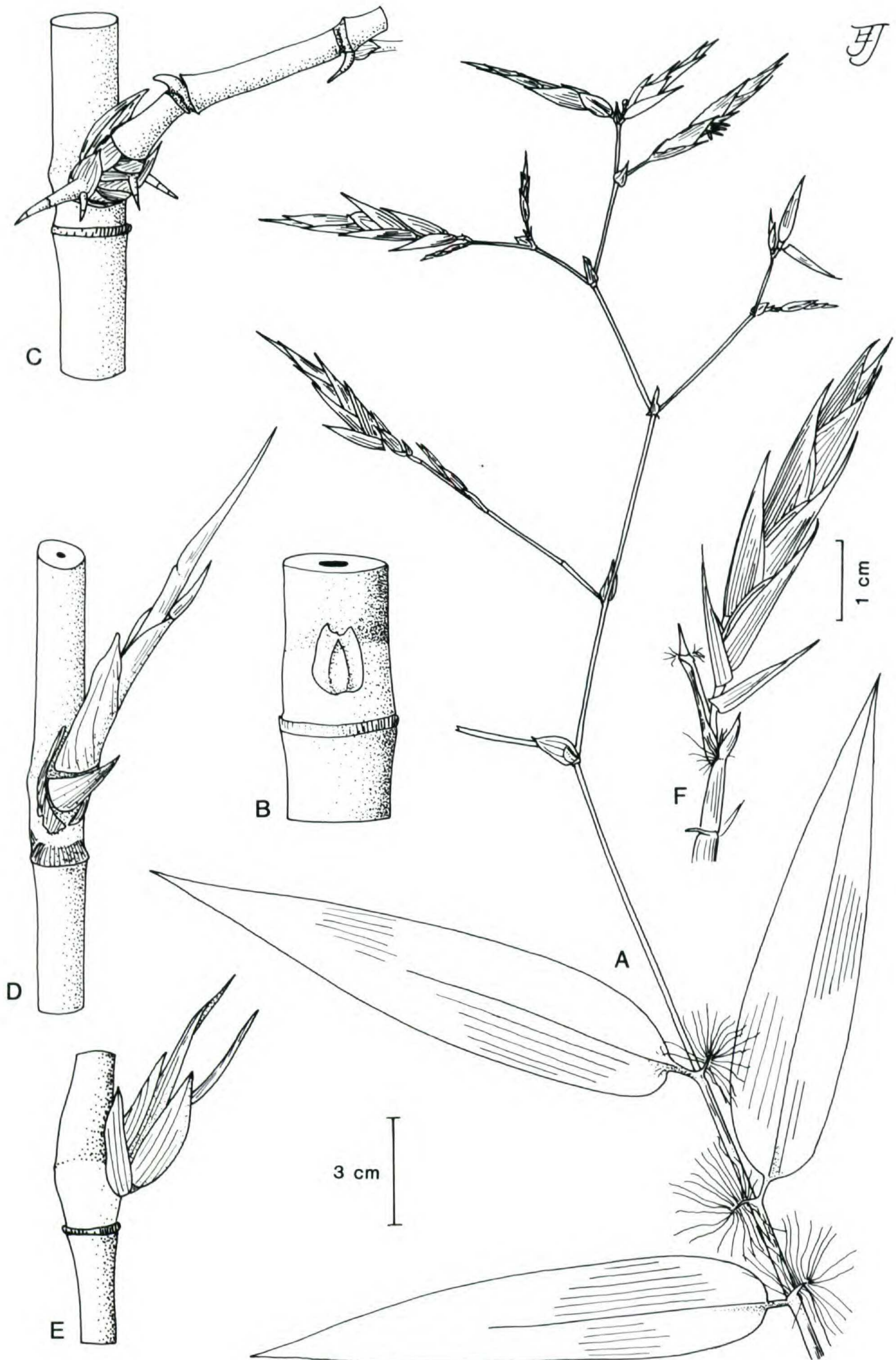


Figure 1. *Guadua calderoniana* Londoño & Judziewicz. —A. Synflorescence terminating leafy branch. —B. Bud at midculm node. —C. Branch at midculm node showing thorns. —D, E. Young branches at midculm node, front and lateral views. —F. Pseudospikelet. (All drawings based on Calderón *et al.* 2386.)

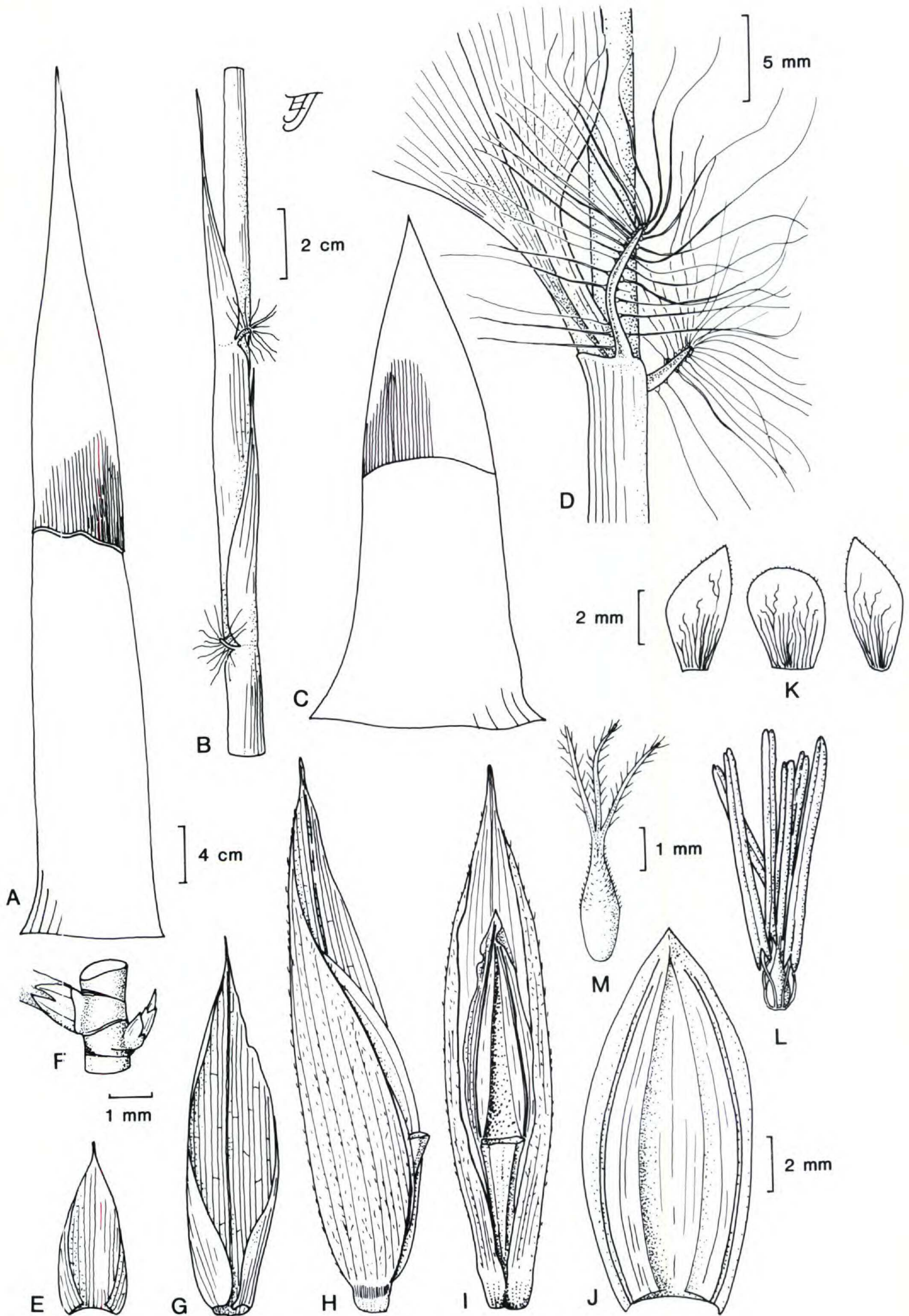


Figure 2. *Guadua calderoniana* Londoño & Judziewicz. —A, C. Culm leaves (spread). —B. Culm leaves in situ, showing auricles and setae. —D. Foliage leaf ligular area, showing prominent auricles and setae. —E. Basal gemmiparous bract. —F. Section of rachilla showing developing bud. —G. Empty bract. —H, I. Floret, lateral and ventral views. —J. Palea, spread ventral view. —K. Lodicules. —L. Androecium of 6 stamens surrounding gynoecium. —M. Gynoecium. (All drawings based on *Calderón et al.* 2386.)

convex, continuous with the blade and confluent with the inner ligule, bearing setose auricles; *auricles* 7–9 mm long, falcate-lanceolate, dark brown, bearing long setae, at length deciduous; *setae* ca. 15 mm long, numerous, arising from the margin and adaxial surface of the auricle, ivory-colored, lustrous, curled distally; *inner ligule* 1.3–3 mm long, membranous, truncate, indurate, stramineous, with ciliolate margins; *outer ligule* absent; *blade* 20–35 × 5–8 cm, equal to or longer than the sheath, or occasionally slightly smaller, persistent, lanceolate-triangular, erect, slightly concave at the base, attenuate-apiculate at the apex, tessellate on both surfaces, abaxially with hard, brown, appressed hairs, these usually denser at the base, adaxially conspicuously nerved with fine, light-brown hairs in narrow, vertical bands, separated by glabrous nerves, the margins smooth. *Branching* intravaginal, solitary and armed, the lowermost nodes developing stout hooked thorns 6–7 cm long, the middle and upper nodes producing a single branch held at a 30° angle, in age developing 2–3 supplemental branches from the basal proximal nodes. *Foliage leaves* borne in lax complements of 12–15 leaves; *sheath* green when young, later stramineous, pubescent on the back, ciliate on the margins, auriculate at the summit, covered with two types of hairs, one type less than 0.05 mm long and densely covering the surface, the other type up to 1 mm long, rigid, hyaline, and perpendicular to the surface; *auricles* 5–10 mm long, falcate-lanceolate, dark brown, glabrous, bearing elongate setae; *setae* 15–25 mm long, arising from the margin of the auricle, slightly curled distally, tawny; *inner ligule* ca. 1 mm long, rimlike, dark brown, ciliolate on the margins; *outer ligule* rimlike, ca. 0.7 mm long, dark brown, puberulent throughout; *pseudopetiole* 5–10 mm long, covered on both surfaces with short, rigid, patent hairs less than 0.5 mm long; *blades* 15–27 × 2–3.7 cm, ovate- to oblong-lanceolate, truncate to rounded at the base above the pseudopetiole, the apex acuminate, symmetrical, glabrous on both surfaces, the midnerve and secondary nerves more prominent on the lower surface, 14–18-nerved, the margins strigose. *Synflorescence* terminating leafy or leafless branches, iterant, polytelic, consisting of 4–5 cymes with 5–15 multiflowered pseudospikelets in each one. *Pseudospikelets* 4–8 × 1 cm, stout, straight, green when young, later stramineous, comprised of a subtending bract, a prophyll, 2–4 basal gemmiparous bracts, 1(–2) empty bracts, 1 sterile lemma, 4–10 fertile florets, and terminating in a rudimentary floret; *rachilla* green, pubescent, always elongated a little beyond the uppermost gemmiparous bract; *subtending bracts* varying in size and shape throughout the main axis,

pubescent, sometimes bearing setae at the summit of the sheath; *prophyll* pubescent, winged, and ciliate on the keels, asymmetrical, enclosing a floral bud; *basal gemmiparous bracts* commonly 2–4 (mostly 3), approximate, positioned close to the prophyllum, 3–7 × 3–5 mm, broadly ovate to ovate-lanceolate, the apex apiculate with a mucro ca. 1 mm long, pubescent abaxially, shiny and lustrous adaxially, the margins ciliate; *empty bracts* 1(–2), 12–15 × 5–7 mm, caducous; *sterile lemma* 15–18 × 5–7 mm, acuminate at the apex, with a mucro ca. 1 mm long, 23–27-nerved, short-pubescent abaxially, shiny adaxially, the margins ciliate, always enclosing a rudimentary palea. *Florets* stramineous; *lemma* 17–27 × 7–10 mm, ovate-lanceolate, the acute apex with a stiff mucro ca. 1 mm long, 23–27-nerved, abaxially stramineous or green with yellow spots and covered with rigid, hyaline, appressed, patent hairs up to 1 mm long, these denser at the base near the junction with the rachilla, adaxially glabrous and glossy, the margins ciliate, completely embracing the palea; *palea* ca. 15 × 7 mm (spread width), somewhat shorter than the lemma, stramineous, glossy, glabrous, with transverse veins between the keels, 9–11-nerved, slightly bifid at the apex, the keels bearing smooth, glossy, hyaline wings ca. 1 mm wide. *Lodicules* 3, membranous, hyaline, many-nerved, glabrous except for bicellular microhairs on the margin near the apex; anterior pair 4–5 × 2–3 mm, spatulate, their apices obliquely acute; posterior lodicule somewhat shorter but just as wide as the anterior pair, truncate to obtuse at apex. *Androecium* with 6 stamens; filaments filiform, free; anthers 7–10 × 0.5–1 mm, sagittate at the base, with a hair at the apex of each theca, purple. *Gynoecium* with ovary 3–8 × 1 mm, fusiform, glabrous at the base, densely antrorse-hispidulous in the middle and upper portions; style hispidulous; stigmas 3, plumose, purple. *Fruit* a fusiform caryopsis 9 × 2 mm (the single example apparently immature).

Paratype. BRAZIL. BAHIA: Mun. Una, 36 km NW of Una on road to São José, elev. 200 m, edge of recently cleared and cut forest, flowering profusely, 23 Apr. 1976, Calderón, dos Santos & de Oliveira 2386 (B, CEPEC, F, G, ISC, K, LE, MO, NY, P, SI, SP, TULV, US—7 sheets, USCH).

Guadua calderoniana appears to be the unnamed native bamboo alluded to by Renvoize (1984: 17, as *Bambusa* Schreb.) in his treatment of the grasses of Bahia. It is known only from two collections made in wet forests at elevations of 100–200 m in Bahia, Brazil, south of the cities of Itabuna and Ilhéus. *Guadua calderoniana* differs from all other congeners in the following distinctive combi-

nation of characters: stout, nearly solid culms (Fig. 1B); usually elongate culm leaf blades (Fig. 2A); prominent foliage leaf sheath auricles bearing elongate setae (Fig. 2D); elongate, straight, stout pseudospikelets (Fig. 1F); and short-pubescent lemmas (Fig. 2H). The prominent foliage leaf sheath auricles bearing numerous, elongate setae are particularly distinctive. The affinities of the new species are uncertain.

The specific epithet honors Cleofé E. Calderón, prolific collector of many new tropical American bamboos.

Like many species of the narrow zone of wet forest in coastal Bahia, *G. calderoniana* is endangered by widespread forest cutting (Mori et al., 1983; Soderstrom & Londoño, 1987, 1988), and, more recently, burning of the small remnants that are left, whether or not they are protected in reserves (Burman, 1989).

2. *Guadua paniculata* Munro, Trans. Linn. Soc. London 26: 85. 1868. *Bambusa paniculata* (Munro) Hackel, Oesterr. Bot. Z. 53: 195. 1903. SYNTYPES: Brazil. Goiás or Tocantins: Rio Tocantins, *Burchell 8852* (BR n.v., fragment and photograph US). Pernambuco: Rio Preto, *Gardner 2981* (fragment US).

Woody and thorny bamboo; culms 5–12 m × 2–6 cm, erect below, arching above, the internodes 25–28 cm long, hollow with walls 3 mm thick, glabrous. *Culm leaves* deciduous, finely pubescent throughout; sheaths 10–20 × 7–18 cm with auricles absent or rarely present and up to 2 mm long; inner ligule 1–2 mm long; outer ligule absent; blades 14–22 × 6–9 cm, triangular, caducous. *Foliage leaves* with sheaths usually glabrous; auricles if present up to 5 mm long, bearing setae 8–10 mm long; pseudopetiole 2–3 mm long, short-hirsute; blades 14–18 × 0.7–1 cm, linear-lanceolate, pubescent on both surfaces. *Synflorescence* with axes pubescent. *Pseudospikelets* 2–3 cm × 2–4 mm, slightly arcuate, 4–6-flowered; lemma 5–7 × 3–5 mm, silky-pubescent on both surfaces; palea 6–8 × 2–4 mm, exceeding the lemma, silky-pubescent, the keels ciliate with inconspicuous wings less than 0.4 mm wide.

Distribution: *Guadua paniculata* is found in a variety of wet to seasonally dry habitats below 1,000 m from Mexico and northern South America to Bolivia, Paraguay, and southern Brazil (Santa Catarina). It is a somewhat polymorphic species that has not yet been well studied.

Specimen examined. BRAZIL. BAHIA: Mun. Andaraí, Serra do Sincorá, 9 km S of Andaraí on road to Itaeté,

elev. 360 m, 12 May 1976, *Calderón, Santos & Oliveira 2433* (CEPEC, US).

3. *Guadua tagoara* (Nees) Kunth, Enum. Pl. 1: 434. 1833. *Bambusa tagoara* Nees, Agrost. Brasil. 532. 1829. TYPE: Brazil. São Paulo: Serra do Mar, towards Guaratinguetá, *Martius s.n.* (holotype, M? n.v.).

Woody and thorny bamboo; culms 20–30 m × 6–10(–15) cm, erect, arching above, the internodes hollow, scabrous. *Culm leaves* deciduous, covered with fine appressed brown hairs; sheaths 17–38 × 20–30 cm, lacking auricles and setae; inner ligule 2–4 mm long; outer ligule absent; blades 3–7 × 9–13 cm, very broadly triangular, erect, persistent. *Foliage leaves* with sheaths ciliate on the margins and often with a line of hairs on one side of the midnerve, otherwise glabrous; auricles absent or rarely present and up to 5 mm long, bearing setae 8–10 mm long at the summit; pseudopetiole ca. 10 mm long, glabrous; blades 21–30 × 3–7 cm, broadly ovate-lanceolate, glabrous. *Synflorescence* with axes glabrous. *Pseudospikelets* 1–3 cm × 3–6 mm, straight, 4–6-flowered; lemma 6–8 × 5–7 mm, papillose abaxially, silky-pubescent adaxially, ciliate on the margins; palea 7–9 × 3–5 mm, exceeding the lemma, puberulous, the keels with puberulent, ciliate wings ca. 1 mm wide.

Distribution: Wet forest edges below 1,000 m in eastern Brazil (Bahia to Santa Catarina).

Specimens examined. BRAZIL. BAHIA: Mun. Itajuipé, 2 km S of Pimenteira on road to União Queimada, Fazenda São Jorge, elev. 500 m, 5 May 1976, *Soderstrom, Russell & Hage 2186* (CEPEC, US); Mun. Gandú, 2 km N of Gandú City on BR-101, Fazenda Santo Antonio, ca. 13°44'S, 39°29'W, 19 Apr. 1972, *Calderón & Pinheiro 2228* (CEPEC, US); Mun. Mascote, 20 km E of Camacã, 9 km W of Santa Luzia do Salobro on road to Canaveiras, edge of Rio Belém, elev. 90 m, 7 Apr. 1976, *Soderstrom, Russell & Hage 2128* (CEPEC, US); Mun. Jequié, ca. 40 km SE of Jequié on road to Ipiaú, elev. 175 m, 16 May 1976, *Calderón, dos Santos & Oliveira 2439* (CEPEC, US).

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